HHS Public Access

Author manuscript

Public Health Nurs. Author manuscript; available in PMC 2016 September 01.

Published in final edited form as:

Public Health Nurs. 2015 September ; 32(5): 421–429. doi:10.1111/phn.12175.

Making a Difference in Migrant Summer School: Testing a Healthy Weight Intervention

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Abstract

Objective—Evaluate the effectiveness of a healthy weight intervention designed for children of migrant farmworkers embedded in a 7-week summer Midwest Migrant Education Program (MEP) for changes in: weight, Body Mass Index (BMI); BMI percentiles (BMI-p); muscle strength and muscle flexibility; nutrition knowledge; attitudes and behaviors.

Design—This is a two-group pre-post quasi-experimental study.

Sample—Latino children of migrant farmworkers attending summer MEP in grades 1 through 8 were enrolled (*n*=171: comparison *n*=33, intervention *n*=138).

Measurements—Weight, BMI, BMI-p, muscle strength and flexibility, knowledge and healthy behaviors.

Intervention—Classroom content included: food variety; increasing fruits and vegetables; healthy breakfasts; more family meals; increasing family time; decreasing TV and electronic game time; increasing physical activity; limiting sugar-sweetened drinks; portion sizes; and food labels.

Results—Statistically significant were: increase in comparison group mean weight, decrease in intervention group BMI-p, and improvements in muscle flexibility and healthy behavior attitudes. The intervention students showed trends towards healthy BMI. The number of MEP days attended was significantly correlated in four outcomes.

Conclusion—Study findings have the potential to decrease incidence of unhealthy weight in Latino migrant children, reduce rates of premature adult diseases in these children, and a potential to decrease future health care costs.

Keywords

Migrant farmworker; child health; obesity

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Migrant and seasonal farmworker labor supports the US agricultural industry with an estimated workforce of three to five million, 51% of whom are parents, and 72% are foreign-born, and with 68% of Mexican nativity (US Department of Labor [DoL], 2010; National Center for Farmworker Health, 2012). While the number of children from migrant farmworker families cannot be quantified, studies conducted in Michigan and Oregon show that there are estimated 14,800 youth under the age of 19 in Michigan (66% aged 12 and under) and 55,000 in Oregon (72% aged 12 years and under) (Larson, 2013a & 2013b).

Research has shown that the peer group of Mexican-American children aged preschool to 11 years old were more likely to have an unhealthy weight than non-Latino Black and non-Latino White children (Ng'andu & Gianfortoni, 2006). Findings from previous studies of migrant farmworker children showed that 47% to 59% of migrant children in grades one through eight ranged were overweight or obese (Kilanowski, 2012; Kilanowski & Liu, 2013; Kilanowski & Ryan-Wenger, 2007). Compared to national statistics, 33% of same-aged children (non-Latino), and 43% of Mexican-American (non-migrant) children were obese or overweight (Centers for Disease Control [CDC], 2010; Ogden, Carroll, Kit, & Flegal, 2012). These higher rates of overweight and obesity in migrant farmworker children greatly exceed the *Healthy People 2020* target goals of the Department of Health and Human Services ([DHHS], 2014).

The purpose of this pilot study, "Nutrition and Physical Activity in the Summer," was to evaluate the effectiveness of a healthy weight intervention designed for the specific vulnerable population of migrant farmworker children delivered on a regular school day during the summer Migrant Education Program (MEP).

Background

A review of published literature shows that few studies have examined the efficacy of healthy weight interventions in underserved populations, such as low-income Latinos. Previously, Latino children occupied small percentages in study samples with high attrition rates except for the El Paso, Texas, Child and Adolescent Trial for Cardiovascular Health (CATCH) study (Coleman et al., 2005). No obesity intervention study has been conducted in a sample of migrant farmworker children, revealing a gap in public health nursing knowledge. When examining the feasibility of using a MEP for health promotion education, Liller and Pintado (2005) in their safety study, found significant increases in safety knowledge and parental approval of the intervention delivery site of a MEP.

Organizations such as the American Academy of Pediatrics (AAP, 2014) and the National Association of Pediatric Nurse Practitioners (NAPNAP, 2013) have established clinical practice guidelines in the identification, prevention, and treatment of childhood obesity. Many states have proposed legislation for school-based evaluation of unhealthy weight, and numerous school and community healthy weight and healthy nutrition interventions have been or are in the process of being scientifically tested for feasibility and outcomes (Institute of Medicine, 2014; National Heart Lung and Blood Institute, 2007). Interventions for childhood obesity have shown promise, and the school environment has been identified as a key setting for health promotion. Meta-analyses of both United States (US) and international

studies have examined the impact of school-based interventions and found improvement in healthy attitudes and behaviors (Harris, Kuramoto, Schulzer, & Retallack, 2009; Pérez-Morales, Bacardi-Gascón, Jiménez-Cruz, & Armendáriz-Anguiano, 2009), medium-term reduction in unhealthy weight (Wang et al., 2013), positive effects on metabolic syndrome (Campos Pastor, Serrano Pardo, Fernández Soto, Luna Del Castillo, & Escobar-Jiménez, 2012), and healthier categories of BMI (Lavelle, Mackay & Pell, 2012; Mahmood, Perveen, Dino, Ibrahim, & Mehraj, 2014). Other studies cautioned interpretation of findings and stressed the need for larger samples and elimination of study bias, such as unrepresentative samples and random variability in data (Khambalia, Dickinson, Hardy, Gill, & Baur, 2012; Waters et al., 2011).

WeCan! CATCH intervention first demonstrated the ability to disseminate a multi-component, multi-year school health program and showed generalized success (Kelder et al., 2005; Perry et al., 1990). The CATCH intervention continues to be replicated with improved design and outcomes, often in after-school programming (Gonzalez-Suarez, Worley, Grimmer-Somers, & Dones, 2009; Hoelscher et al., 2010; Sanigorski, Bell, Kremer, Cuttler, & Swinburn, 2008). In addition, the CATCH intervention has been successfully adapted to particular samples and study environments with significant results in decreased TV viewing in males; decreased body mass index (BMI) z-scores in males; increased daily physical activity in females (Wright, Newman Giger, Norris, & Suro, 2013); and increased vigorous physical activity in both genders (Seo et al., 2013). Moreover, in a farm-to-school and nutrition study there was an increase in knowledge of fiber, vitamins, minerals and vegetables (Moss, Smith, Null, Long Roth, & Tragoudas, 2013). While many studies showed merit with positive outcomes in 64% to 68% of programs, no one program emerged as a model of best practice, and researchers concluded that even program outcomes with short-term improvements should be supported (Flynn et al., 2006).

The research question to evaluate this healthy weight intervention was: what are the differences in pre- and post-intervention weight, BMI and BMI-percentiles (BMI-p), muscle strength and muscle flexibility, nutrition knowledge, and healthy attitudes and behaviors, in MEP students who participate in a health intervention compared with MEP students who do not? It was expected that students who participated in the MEP with the supplemental health curriculum would yield better outcomes in decreased BMI and BMI-p, increased muscle strength and muscle flexibility, increased nutrition knowledge, and healthier attitudes and behaviors compared with the non-intervention group. In addition, correlations and associations between attendance and student outcomes were evaluated, as well as changes in anthropometric findings of rank correlation between the intervention and comparison group.

Achterberg and Miller (2004) suggest that a poly-theoretical model for nutrition education might be ideal over a singular dominant theory. The framework for this study drew from the Theory of Culture Care Diversity and Universality for its consideration of cultural sensitivity in learning objectives (Leininger, 1978); the PRECEDE-PROCEED Model of Health Program Planning and Evaluation for public health implementation considerations (Green & Kreuter, 1999); educational theory for how students learn (Bransford, Brown, & Cocking, 1999; Krajcik, Czerniak, & Berger, 1998); age-specific nutrition for curricula content (French, Howell, Haven, & Britten, 2006); and developmental guidelines from

Piaget (1963) and Erikson (1963) for appropriate student capabilities. These multidisciplinary theories sought to holistically address student needs and characteristics. The Frieden (2010) conceptual framework for public health action states that health promotion education interventions located at the top of the Health Impact Pyramid (counseling and education) have been identified to only help individuals, but has the potential to impact a larger population if applied universally. This study examined if the intervention delivered in a summer Migrant Education Program could result in positive health changes in the specific group of migrant farmworker children.

Methods

Design

The pilot study design was two-group quasi-experimental with a convenience sample.

Setting

The study was conducted in two Midwest MEPs located within six miles of each other whose directors agreed to allow access to the research team. MEPs are funded through formula grants from the Education of Migratory Children, Title I, Part C, and supports remedial education programs for eligible migrant children to promote student success and meet their unique needs (Spellings, 2007, US Department of Education, 2013). Migrant workers are typically defined as persons who travel at least 75 miles during a 12-month period to obtain agricultural employment (DoL, 2010). This federal program is offered free of charge to qualifying families and provides free breakfasts, lunches, and snacks under the US Department of Agriculture [USDA] Summer Food Service Program (USDA, 2014). Free bus transportation is also provided. The educational programs run for 8 hours a day, late June to early August. Class size varies, and teachers and aides are often of Latino ethnicity with high retention rates.

Sample

Study participants were students in grades one through eight. The intervention site (n = 138) served pre-school to high school student with an approximate enrollment of 400, but high school students were not enrolled in the study. The comparison group (n = 33) enrolled 120 students in grades pre-school to grade eight. Each MEP site shared similar demographics. Inclusion criteria were: (1) migrant children in grades one through grade eight enrolled in a summer MEP whose parent or legal guardian was at least 21 years old and able to provide signed consent in English or Spanish; and (2) oral assent of all children and, written assent for children 8 years and older. While assent was offered in both languages, children chose to give written assent in English. The University Institutional Review Board approved the study by expedited review.

Measures

Along with the consent process for their children parents completed a short bilingual demographic questionnaire. Students who enrolled in the study had growth parameters; muscle strength and flexibility; nutrition knowledge tests; and CATCH attitude and behavior scales measured at pre (T1) to and post (T2) intervention.

Anthropometric measurements were obtained using a Tanita HD-314 digital scale (Arlington Heights, IL) and Seca 213 portable stadiometer (Hanover, MD). BMI and BMI-p were calculated using the Centers for Disease Control (CDC) online BMI calculator.

As established by the Young Men's Christian Association (YMCA), the number of repetitive push-ups without pausing by the student participant measured muscle strength. Push-ups are a barometer of fitness and muscle strength and test the whole body by engaging muscle groups in the arms, chest, abdomen, hips and legs (Golding, 2000). Muscle flexibility was assessed with the Sit and Reach Test Box that is the most widely used research measure of flexibility (Golding, 2000). The test is designed to measure the extensibility of hamstring muscles and the lower back articulations by evaluating the maximal reach an individual can make in a seated position and is used to measure flexibility. Numerical counting by the student and teacher verified the number of push-ups, and consensual teacher-student visualization of distance verified the sit-and reach tests. Data were also collected on program attendance as counted by the administrative offices and on student demographic data including age, gender, grade, teacher, and site location.

Student development was considered during selection of knowledge assessment tools and all assessments were administered in English, the language of choice for the students. To evaluate nutrition knowledge in grades 4 through 8, the CATCH nutrition knowledge, and behaviors and attitudes assessment measures were administered (NHLBI, 2007; Perry et al., 1990). These measures have been previously tested with test-retest reliability in large National Institutes of Health funded multisite research studies. Cronbach's alpha of CATCH nutrition knowledge subscales in our pilot were r = .807 to .746. Reliability of the CATCH assessments of attitudes and behaviors subscales in our pilot were r = .652 to .803. Other teacher-made knowledge tests following state grade-level health objectives were administered. Pictorial MyPyramid food group sheets available from the CDC Team Nutrition website (which is no longer available) were used to assess intervention objectives learned by grades 1 through 3.

Analytic Strategy

Preliminary analysis using exploratory data techniques was used to examine univariate characteristics and bivariate relationships among covariates and between covariates and outcomes. These exploratory techniques were based on proportions and medians and/or means. Parametric and non-parametric tests were used to compare outcomes from independent samples depending upon the distributional characteristics of the variable. Paired *t*-tests were utilized to compare pre- and post-tests. For comparisons of means for two dependent samples and sample sizes ranging from 97 to 110, a post hoc power of 0.80 allowed detection of effect sizes ranging from .25 to .24. For correlations, a post hoc power of 0.80 allowed detection of moderate to large effect sizes ranging from .35 to .23.

The Intervention

This study delivered nutrition and physical activity through calisthenics and sport lessons to migrant children by using an existing summer MEP and the MEP provided a part-time media teacher, one classroom devoted to the intervention, and some administrative support.

The researchers had several planning sessions with the administration and key staff to discuss research design and implementation of the project. Prior to the start of the MEP program the entire staff was given an orientation session on the intervention curriculum informing of its design and objectives. This study incorporated recommendations from the Caballero et al. (2003) intervention study with Native American children that stressed the need to respect and honor the heritage of participants when designing health education content.

The pediatric nurse practitioner researcher developed three levels of age-appropriate healthy eating instruction for grades one through three, four through five, and six through eight. Curriculum objectives and content used information from pediatric health care organizations, state educational standards, *WeCan!*, the CDC, and various pediatric care resources. The study employed one teacher certified in health, nutrition, and physical education who administered the intervention. See Table 1 for a description of the pattern and dosing of the intervention. Classroom instruction included: understanding food variety; eating more fruits and vegetables; healthy breakfasts; increasing family meals and family time; decreasing TV and electronic game time; being physically active daily; limiting sugar-sweetened drinks; portion sizes; and food labels.

The intervention study also provided classroom materials such as crayons, pencils, and paper; food supplies; and physical education/playground equipment such as sport balls, jump ropes, and softball field equipment. In addition, children's trade books (non-textbooks) were used to supplement classroom lessons with children's literature characters eating healthy foods or engaging in exercise or activity. Older students had selections of sport biographies of Latino athletes. Homeroom teachers borrowed classroom sets of the intervention trade books for their instructional or recreational reading groups. Student classroom worksheets were taken home to share with parents. To keep the homeroom teachers informed of the healthy eating lessons discussed in the intervention classroom, several key messaging flyers were placed in the teachers' mailboxes. Intervention fidelity followed the guidelines of Borrelli et al. (2005) and was monitored on a regular basis with visits and electronic communication. Protocol binders maintained fidelity of the intervention between classes of the same grade level.

The comparison group received no other instruction with the exception of bilingual healthy-eating low-literacy, publicly available CDC flyers on healthy eating that were distributed to students in class and sent home in students' backpacks.

Results

Enrollment data from the MEP's administrative offices indicated that all student participants were Latino and children of migrant farmworkers. Descriptive characteristics of the student participants including percent of children in weight classifications and changes in BMI-p for both the intervention and comparison groups can be seen in Table 2. In pilot year one (n = 171: comparison n = 33: intervention n = 138), there was a statistically significant increase in mean weight only in the comparison group (t (30) = 2.506, p = .02) from T1 to T2. At the end of the summer program, no child in the comparison group moved to a healthier BMI-p

classification, compared with 12% of intervention students who entered a healthier BMI-p classification. The intervention group showed a statistically significant decrease in BMI-p with a paired *t*-test (t (78) = 2.325, p = .02) with an effect size of .24. In the intervention group there was a non-significant decrease in mean BMI from T1 to T2 (from M = 21.27, SD 9.14 to M = 20.77, SD = 4.56). In two age-appropriate knowledge assessments 70%, (n = 47) and 63% (n = 46) of students in the intervention group showed improvement of scores, although these were non-significant.

Bivariate correlation analysis of intervention data at the end of 7 weeks showed that the greater number of MEP days attended was significantly correlated in four student outcomes. Intervention students showed greater decrease in weight loss and greater achievement of healthier BMI. In addition, the CATCH questionnaires showed there was an increase in healthy behaviors to drink milk or eat cheese at least twice daily, as well as an increase in healthy attitudes rooted in the belief that students needed to work hard to become strong (see Table 3).

Non-parametric analysis was used to describe association and changes in anthropometric findings of rank correlation, and to assess if mean ranks differ in both the intervention and comparison groups from T1 to T2. There was a non-significant negative correlation of BMI with the intervention group. When comparing the intervention group to the comparison group there was a significant decrease in weight and a trend towards decrease in BMI from T1 to T2 (see Table 4).

Discussion

Age-specific and ethnically appropriate healthy eating and activity education is important in the public health fight against childhood obesity (Robert Wood Johnson Foundation, 2010). A barrier to progress in addressing the problem of unhealthy weight in an itinerant population such as migrant farmworkers is that migrant children experience an interruption in their academic studies as they move from one school district to another. State educational guidelines contain health curricula: however, the disjointed education of migrant children potentially creates missed learning opportunities. Some researchers believe nutrition education should be offered to children at least three times per year (Cirignano, 2010), but migrant children may not be present to benefit from the health lessons. In addition, existing health promotion lessons have been designed for the majority population and may not recognize or appreciate cultural differences in diet and lifestyles. It is not known if the intervention and not chance affected study outcomes. It is acknowledged that there are other potential reasons for the trend towards lower BMI, such as the meals consumed at the MEP and not at home, and age-appropriate growth factors. However, a recent article informs researchers that science's failures (not finding statistical significance) are sometimes just as important as its successes; success defined as finding statistical significance in outcomes (Collins, 2014). It suggested that science benefits from null results and lessons are learned to benefit the next study, especially with underserved populations.

Lessons learned

We learned many valuable lessons in this community-based study, notably that more personnel were needed to ensure that research objectives were achieved. Distance from the university to the MEP also created challenges in schedules, transportation, and supply storage. Although this project began with contributions and direction from Latino community leaders, the dialogue needed to be regularly continued and revisited with administrators, teachers, and staff. The Principal Investigator achieved this by having an extended presence at the school, eating lunch with the children and staff, assisting in data collection, and teaching occasional intervention lessons. Initially, the comparison group welcomed participation in the research study and anticipated a larger enrollment than occurred in reality. However, the group became resistant to the schedule required for the research team to collect data and administer post-assessments in a timely manner. Future studies need to improve communication with the comparison group and review documents of past enrollment numbers and not just oral reports.

Limitations of the study

There are several limitations to this study. One of the challenges of working with migrant children is the irregular school and intervention attendance (Kilanowski, 2014). Often, older students would leave the MEP to assist in harvest thus affecting completion of study assessments. Student absences resulted in compromised sample sizes that affected analysis. The limited number of post-tests from the comparison group in the study represents a threat to validity of results.

Other limitations of the study included a restricted geographic area. The research findings cannot be generalized to the larger MEP student populations. Data were analyzed at the student level: it would have been ideal to examine grade-level outcomes, but cell sample sizes were modest and unequal. Sample sizes prevented this pilot study from controlling for different schools, which could lead to potential bias in estimating the relationship of outcomes with the intervention. Additional limitations include the unequal distribution of participants in the intervention and comparison groups. The comparison group was not adequately powered and it cannot be ruled out that intervention observed changes attributed to chance. Furthermore, as per the transfer of knowledge learned in the intervention to everyday life; children of these ages do not control family food choices, and their parents have limitations to food choices due to geographic location, market food selection, cooking facilities, and financial resources.

Conclusion and recommendations

Past research has shed light on the problem of unhealthy weight in migrant farmworker children (Kilanowski, 2012; Kilanowski & Li, 2013; Kilanowski & Ryan-Wenger, 2007). Because migrant children have unique socioeconomic and cultural characteristics, health promotion interventions should reflect cultural humility to optimize acceptance and success (Miller, 2009; Racher & Annis, 2007). Currently, there are insufficient interventions designed to address health disparities in children from ethnic and racial groups. Until this study, little was known about the effectiveness of using existing student migrant programs for a healthy weight intervention.

Currently, there are little standardized curricula in the MEP. Each site has local control over curricula content with guidance from state education standards and state migrant education offices. The intervention students' data showed trends towards a healthier BMI and increased nutrition knowledge. There was a statistically significant decrease in the intervention group for BMI-p, as well as statistically significant improvements in muscle flexibility and healthy behaviors and attitudes. However, future research must secure larger sample sizes for improved statistical analysis.

This study focused on the important public health problem of pediatric obesity among an underserved, vulnerable, minority population. This study fills a gap in the published public health nursing literature on the effectiveness of research interventions with migrant children, and how existing summer school programs can be utilized to present health promotion education to a marginalized student population. It also identifies a gap that future research must fill. The conduct of studies with these vulnerable populations may not be easy, and the need for complex study designs to accommodate the unique characteristics of the population may create threats to internal and external validity. However, these study findings have the potential to decrease incidence of unhealthy weight in these Latino children, reduce the rate of premature adult diseases, and decrease future health care costs.

Findings of this study can inform practice, especially in the current climate of sparse research funding and limited educational budgets. By employing the infrastructure of an existing program, a cost-effective environment to disseminate health teachings was utilized. The results of this research may influence curriculum policy in the Office of Migrant Education, and provide evidence that a standardized health education component would be a valuable addition to the summer Migrant Education Program. The knowledge gained from this study can also serve as a prototype for healthy weight and nutrition intervention research, and guide development for programs for other immigrant children and urban Latino youth. Public health nurses would be instrumental in the delivery of such community programs. In conclusion, even with the study's limitations, statistical evidence was present to answer the research question: Students who attended the supplemental nutritional and physical activity curriculum demonstrated statistically significant or positive trends in student outcomes. Future research may include examining such interventions in a longitudinal study and crossover analysis of carryover knowledge from one year to the next, and include family and community interventions.

Acknowledgments

The Case Western Reserve University/Cleveland Clinic Clinical Translational Science Collaboration Grant Number UL1 RR024989, provided funding support and originated from the National Center for Research Resources (NCRR), a component of the National Institutes of Health (NIH) and NIH Roadmap for Medical Research. The contents of this article are solely the responsibility of the author and do not necessarily represent the official view of NCRR or NIH. The Principal Investigator would like to acknowledge Wendy Syswerda (intervention teacher); the Migrant Education Van Buren Intermediate School District, in Lawrence, Michigan; and the administration, staff, students and families of summer Migrant Education Programs in Michigan.

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Table 1

Description of Nutrition and Physical Activity in the Summer Study Intervention: Delivery Method, Dosing, Special Activities, and Participants' Give-aways

	Nutrition content	**Physical activity content**
Delivery methods	Classroom presentation, children's trade books on nutrition topics	Outdoor or indoor instruction on calisthenics, sports instruction for soccer, tee-ball, baseball, football, and basketball
Times/ week	Twice-a-week nutrition content (45 minutes middle school; 30 minutes lower school)	Twice a week physical activity instruction (45 minutes) Daily recess (30 minutes)
Special activities	Four hands-on food labs tasting new foods and preparing healthy recipes	End-of-summer athletic competition field day, ribbons for achievement
Give a-ways	Three books with nutrition content	T-shirts with healthy eating and activity logos One physical activity-themed book Choice of hula-hoop, jump rope, or playground ball

Table 2

Characteristics of Intervention and Comparison Group Students in Pilot Study: Gender, Grade, Body Mass Index Percentiles (BMI-p), and Change in BMI-p

	Total N (%)	Comparison n (%)	Intervention n (%)
Total	171	33	138
Gender			
Girls	77 (45)	14 (42)	63 (46)
Boys	94 (55)	19 (58)	75 (54)
Grade			
Grade 1 to 5	147 (86)	25 (76)	122 (88)
Grade 6 to 9	24 (14)	8 (24)	16 (12)
First BMI-p* classification	127	32	95
Underweight	4 (3)	0	4 (4)
Normal weight	63 (50)	26 (81)	37 (39)
Overweight	26 (20)	3 (9.5)	23 (24)
Obese	34 (27)	3 (9.5)	31 (33)
Second BMI-p* classification	112	31	81
Underweight	5 (4)	0	5 (6)
Normal weight	53 (47)	24 (77)	29 (36)
Overweight	23 (21)	4 (13)	19 (23)
Obese	31 (28)	3 (10)	28 (35)
Change in BMI-p*	110	31	79
Decrease	59 (54)	14 (45)	45 (57)
No change	20 (18)	6 (19)	14 (18)
Increase	31 (28)	11 (36)	20 (25)

* Body Mass Index percentiles (BMI-p) for age and gender

Table 3

Pilot Study: Significant Bivariate Correlation Analysis of Intervention Group Comparing Migrant Education Program Attendance and Student Assessment Outcomes

Student outcome	n	r	*p*-value
Greater decrease in weight loss	78	−.24	.03
Greater achievement of desirable BMI	78	−.29	.01
Drink milk or eat cheese at least twice a day	45	.33	.02
Student belief that they needed to work hard to become strong	45	.43	.006

Table 4

Pilot Study Statistically Findings: Noteworthy Non-parametric Results of Intervention Group Students' Anthropometric Assessments

Statistical Test	Comparison of two groups	Intervention students' outcomes	n	r or z	p-value
Kendall Tau's correlation	Intervention and BMI	Decrease in BMI	110	$r = -.16$	.07
Wilcoxon 2 sample test	Intervention vs. comparison	Decrease in weight	110	$z = -1.61$	.05*
Wilcoxon 2 sample test	Intervention vs. comparison	Decrease in BMI	110	$z = -1.55$	.059

r = Pearson correlation coefficient

z = Rank sums

BMI = Body Mass Index

* Significant